

ASSOCIATION BETWEEN TOPHUS INVOLVEMENT OF TENDON AND SERUM URIC ACID LEVELS?

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ABSTRACT

Background: Serum urate (SU) concentration represents the balance between the breakdown of purines and the rate of uric acid renal excretion. Its solubility threshold is approximately 7 mg/dL, and when exceeded, interstitial fluids become oversaturated, which in turn increases the likelihood of monosodium urate (MSU) crystal tissue deposition. **Material & Methods:** In the present cross-sectional prospective study 100 Patients presented with diagnosis of gout according to the American College of Rheumatology (ACR) criteria fulfills the entry criterion (at least one episode of swelling, pain, or tenderness in a peripheral joint) and with serum uric acid level between 5.5 - 9 mg/dl were included in this study. **Results:** Uric acid level between 7 - 9 mg/dl found in 68% and it was in age between 21yr – 45 year of age. 68% patients had pain at entheses for at least once before inclusion in the study. 27% patients had history of serum uric acid more than 7 mg/dl and history of joint pain. In our study Patellar tendon is the most frequently involved tendon followed by quadriceps, achilles and peroneus tendon. Both patellar tendon and quadriceps tendon in 6 patients, both patellar and Achilles tendon involved in 6 patients. Both quadriceps tendon and Achilles tendon in 7 patients. **Conclusion:** Tophus involvement of tendon in the lower limbs in gout is very frequent, particularly at the patellar tendon, Quadriceps tendon and Achilles tendon.

Key words: Tophus, Uric acid, Tendon, Ultrasound

INTRODUCTION:

Serum urate (SU) concentration represents the balance between the breakdown of purines and the rate of uric acid renal excretion. Its solubility threshold is approximately 7 mg/dL, and when exceeded, interstitial fluids become oversaturated, which in turn increases the likelihood of monosodium urate (MSU) crystal tissue deposition (1). The MSU crystal deposition can be clinically expressed as gouty arthritis, tophi formation, urate nephropathy or urolithiasis (2).

While the usefulness of urate-lowering treatment in patients with clinical manifestations of hyperuricemia such as gouty arthritis or nephropathy has been largely established, its use in asymptomatic hyperuricemic individuals is still the object of several controversies (3). This could in part be related to the limited evidence about the subclinical musculoskeletal involvement in asymptomatic individuals with hyperuricemia (4). An increase in the prevalence of both hyperuricemia and gout has been shown during the previous decades in developed

countries. The association of hyperuricemia, but especially of gout, with cardiovascular outcomes and the opportunity of further benefits of early intervention have been recently highlighted. The fact that crystal deposition and subclinical inflammation precede the clinical onset of gout may deliver a new approach to the treatment of hyperuricemia and gout.

Gout is due to the nucleation and growth of monosodium urate (MSU) crystals in tissues in and around the joints, following long-standing hyperuricemia, that is, serum urate (sUA) above the saturation threshold. Although the best imaging method to investigate the presence of MSU crystal deposits in the early stages has not yet been established (5), ultrasound (US) has been demonstrated to be a valid imaging modality to detect musculoskeletal involvement in patients with gout (6-9). The main US findings related to MSU crystal deposition include hyperechoic enhancement of the superficial margin of the hyaline cartilage (double contour sign), hyperechoic spots within tendons and soft tissues, tophi and bone erosions (7,10,11). Additionally, an increase of blood flow surrounding the MSU deposits detected by power Doppler (PD) has been described as an indicator of inflammatory activity (5,7). The objective of the present study was to evaluate, by US, the prevalence of tendon involvement in the quadriceps, patellar, peroneus, and Achilles tendons in gout with serum uric level between 5.5 - 9 mg/dl.

MATERIALS & METHODS

The present cross-sectional prospective study was conducted at department of orthopedics of our tertiary care hospital. The study duration was of one year and eight months from January 2017 to August 2018. A sample size of 100 was calculated at 95% confidence interval at 10% acceptable margin of error by epi info software version 7.2. Patients presented with diagnosis of gout according to the American College of Rheumatology (ACR) criteria fulfills the entry criterion (at least one episode of swelling, pain, or tenderness in a peripheral joint) and with serum uric acid level between 5.5 - 9 mg/dl were included in this study. Clearance from Institutional Ethics Committee was taken before start of study. Written informed consent was taken from each study participant.

Patients who had co-morbidity like uncontrolled diabetes mellitus, cancer, chronic alcoholic, neurologic diseases were excluded from the study.

All patients include in this study were sent to ultrasound (US) examination. US examination included the quadriceps tendons, the patellar Tendon, peroneus tendon and the Achilles tendon. All tendons were evaluated bilaterally according to the EULAR guidelines for performing US in rheumatology.²⁶ US elementary lesion evaluation comprised the intra-tendinous tophus, defined as an inhomogeneous, circumscribed, hyperechoic and /or hypoechoic aggregate, which may or may not generate posterior acoustic shadowing and which can be surrounded by a small anechoic halo. All patients were regularly followed upto complete clinical remission of symptoms and at every month with repeat serum uric acid test till it become normal. Data analysis was carried out using SPSS v22. All tests were done at alpha (level significance) of 5%; means a significant association present if p value was less than 0.05.

RESULTS

In present study, among the total 100 patients which were aged between 20 - 64 year but the majority of the patients were from the age group of 21 -45 year. The youngest patient was 21 years of age and the oldest patient was 64 years. In this study male patients were 79% and 21% patients were female. In this study, out of 100 patients with serum uric acid level between 5.5 -9.0 mg/dl with age from 20 year to 64 year were included. Uric acid level between 7 - 9 mg/dl found in 68% and it was in age between 21yr – 45 year of age. 68% patients had pain at entheses for at least once before inclusion in the study. 27% patients had history of serum uric acid more than 7 mg/dl and history of joint pain. (Table 1)

Table 1: Distribution of study participants according to age and gender

Parameters		No. of patients (%)
Gender	Male	79
	Female	21
Pain in (at least one) entheses site		68
Previously diagnosed high uric acid (7 mg/dl and above)		27

Intra-tendinous tophi and hyperechoic aggregates were the most frequent lesions at the tendon in US examinations. In our study Patellar tendon is the most frequently involved tendon followed by quadriceps, achilles and peroneus tendon. In this study isolated patellar tendon involved in 8 patients, isolated quadriceps tendon involved in 7 patients, isolated Achilles tendon involved in 4 patients, isolated peroneus tendon involved in 3 patients, both patellar tendon and quadriceps tendon in 6 patients, both patellar and Achilles tendon involved in 6 patients. Both quadriceps tendon and Achilles tendon in 7 patients. (Table 2)

Table 2: Distribution according to full weight bearing (in weeks) according to procedure.

US signal changes in Tendon involvement	No. of patients (%)
Isolated quadriceps tendon	7
Isolated patellar tendon	8
Isolated Achilles tendon	4
Isolated peroneus tendon	3
Both quadriceps and patellar tendon	6
Both quadriceps and Achilles tendon	7
Both patellar and Achilles tendon	6
Total	41%

DISCUSSION

Tendon involvement in patients with gout is frequent, as has been shown in this study and other recently published data.^{7,12,22} In the present study among the total 100 patients which were aged between 20 - 64 year but the majority of the patients were from the age group of 21 -45 year. The youngest patient was

21 years of age and the oldest patient was 64 years. In this study male patients were 79% and 21% patients were female. In this study, out of 100 patients with serum uric acid level between 5.5 -9.0 mg/dl with age from 20 year to 64 year were included. Uric acid level between 7 - 9 mg/dl found in 68% and it was in age between 21yr – 45 year of age. 68% patients had pain at enthesis for at least once before inclusion in the study. 27% patients had history of serum uric acid more than 7 mg/dl and history of joint pain. A single study has evaluated, by means of US, the presence of tophi in different regions in order to demonstrate localization and a characteristic pattern to differentiate tendon involvement from tophi.¹² However, in that study, the study sample was too small and did not have an US definition for tophi, in terms of how these are known at present.^{12,28,29} Tendon involvement, in gout, has been evaluated systematically by US and DECT in a few studies.^{12,13}

In our study, intra-tendinous tophi and hyperechoic aggregates were the most frequent lesions at the tendon in US examinations. In our study Patellar tendon is the most frequently involved tendon followed by quadriceps, achilles and peroneus tendon. In this study isolated patellar tendon involved in 8 patients, isolated quadriceps tendon involved in 7 patients, isolated Achilles tendon involved in 4 patients, isolated peroneus tendon involved in 3 patients, both patellar tendon and quadriceps tendon in 6 patients, both patellar and Achilles tendon involved in 6 patients. Both quadriceps tendon and Achilles tendon in 7 patients. Similar to the reported by Peiteado et al.⁸ Also, in the data of the study of Naredo et al, patellar tendon together with triceps had high specificity and predictive positive value to diagnosis gout so they propose Prevalence of intra-tendinous aggregates and tophi in gout Tendon involvement in patients with gout.

Ventura-Ríos et al observed that the prevalence of intratendinous tophi and hyperechoic aggregates in all affected tendons was significantly higher in the gout group than in osteoarthritis. Around half of our patients exhibited tophi and hyperechoic aggregates at the Achilles tendon, similar to those detected by DECT in the foot.¹³ as in other studies, because this

elementary lesion is not exclusive to gout.²² In this study male patients was four fold than female patients. Other study also shows that It occurs in men 2-6 fold more than women. The general prevalence of gout is 1-4% of the general population. Worldwide incidence of gout increases gradually due to poor dietary habits such as fast foods, lack of exercises, increased incidence of obesity and metabolic syndrome.² In our study patient with high uric acid 67.59 percent had at least one episodes of enthesitis pain. MSU crystal deposition in tendons is a frequent manifestation of extra-articular gout, more frequently affecting the Achilles, patellar, peroneal, and the flexor and extensor tendons in the hand.⁹⁻¹¹ Microcrystalline deposits may be localizing in the body of the tendon, around, or even at the enthesitis, frequently in more than one location.¹²

CONCLUSION

Tendon involvement in the lower limbs in gout is very frequent, particularly at the patellar tendon, Quadriceps tendon and Achilles tendon. Ultrasound is a good noninvasive procedure to detect the intratendinous tophus. Patients with high uric acid level and pain in enthesitis site, US can detect tophus deposition in early stage.

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